opposite the beautiful Franklin Square, when after some pleasant reminiscences of their old association the genial old professor remarked: "There is no question in my mind but that Professor Espy should be regarded as the father of the present Signal Service of the United States,[2] his theory of storms having led the way to its establishment and present success," adding that the charts now used in the service were identical (with some slight modifications)[3] with those the old Storm King constructed for use in the Meteorological Bureau of the War Department when he was at its head. This interview occurred in 1875. General Myer, "Old Probabilities," as he was called, made a similar statement to the writer.

The mineral springs at Bedford, so fashionable a resort 50 years ago, are situated about one mile from the village, and were often visited by Professor Espy during the many years of his residence in Philadelphia, where he taught a classical school while investigating the phenomena of the forces of the atmosphere which led to his discovery of "The Theory of Storms."

An old friend of the professor, a fellow-scientist, who visited him often at his home on Chestnut street, described to the writer his method of pursuing his atmospheric calculations, which necessarily must be carried on out of doors. The fence inclosing the small yard was of smooth plank, painted white; the yard was filled with vessels of water and numerous thermometers for determining the "dew-point". The white fence, when the narrator saw it, was so covered with figures and calcutions that not a spot remained for another sum or column.

In 1839 Mr. Espy visited England for the purpose of presenting his theory of storms before the British Association of Science. Sir John Herschel, with other eminent scientists, was present and received him with cordial greetings and warm appreciation. He spent several weeks most delightfully in many of the "stately homes" of that country, where he and his wife were agreeably entertained. In the autumn of the same year he visited Paris, where a committee had been appointed by the Academy of Science to receive him, presided over by the illustrious Arago, who was enthusiastic in his reception of the storm theory, as presented to them in several lectures by its discoverer. In his address of welcome, Arago remarked that "England had its Newton, France its Cuvier, and America its Espy." Students of nature are usually of serene and happy temperament, and Mr. Espy was no exception to the rule. He never seemed impatient or concerned at the slow recognition of his discoveries as means of practical use in commerce or other national needs. He would say, "I leave all this to the future, sure that its adaptations to the uses of life must one day be seen and acknowledged." He left no children, and but few are now living of his near relatives, but those few remember with reverence the broad charity and earnest purpose of the "Storm King."

LECTURES ON METEOROLOGY.

Referring to a gentleman who desires material to enable him to give a lecture on meteorology, one of our best section directors quotes the State School Commissioner to the effect that the teachers and children of the State should be protected from lectures or instruction of the character contemplated by the proposed lecturer.

This remark may apply possibly to many others. Errors are disseminated by public lecturers quite as easily as by books or any other method. It is impossible but that errors should exist and be propagated, like noxious weeds, but the wiser commissioners of education, school commissioners, or other authorities do the best they can to secure the best available teachers and lecturers. The great demand for such instruction in meteorology will be realized when we consider that in one single State alone there will be held 50 teachers' institutes during August, 1906, and other States will hold as many, or even more. Therefore incomplete and inaccurate teaching is inevitable. The Weather Bureau can not supply the intense demand for lecturers during the summer season, although the Chief will do the very best he can. Our best school books probably contain errors relating to meteorology, but they do not attempt to answer the innumerable questions, sometimes very foolish and unnecessary, that are asked by the teachers and the scholars whenever they come in personal contact with an intelligent meteorologist.

We hope that some of our best men may have time to prepare lectures to be sent in typewritten copies, or newspaper print, to many educational centers, where they may be delivered orally, precisely as has been done for many years past with great success in the State of New York.

In other cases some of our best men might well take two months' furlough in the summer and devote themselves wholly to the work of the teachers' institutes. They would probably reach several hundred persons every day of the week, and disseminate valuable information among the teachers, which would be retailed to the tens of thousands of scholars.

[2] There are many others who have equal claims to be called "fathers" of the beneficent Weather Bureau.—*C. A.*

[3] These modifications are very important and fundamental.—*C. A.*

HAILSTORM IN THE BAHAMAS.

On page 260 of the MONTHLY WEATHER REVIEW for June, 1905, we published some account of a hailstorm on April 18 in the island of Spanish Wells, about fifty miles west of Nassau, an event that was said to have been very local and entirely phenomenal. The following note relates to a similar hailstorm, 60 miles east of Nassau. From these two reports it is reasonable to infer that local hailstorms are no rarer in that region than in many other parts of the world. Such storms are always local, and there is but small chance that they will frequently visit any locality, such as the small individual islands of the sparsely inhabited Bahamas. Nothing but a faithful record for many years would justify any attempt at determining the relative frequency of these local hailstorms. Our own impression is that a given square mile of territory anywhere in the United States east of the one hundredth meridian is about as liable to experience a severe hailstorm as it is to experience a disastrous tornado, and that is to say about once in a thousand years.

NOTE BY P. H. BURNS, SUPERINTENDENT BAHAMAS CABLE.

On Sunday morning, February 14, 1906, between midnight and one o'clock a. m., a severe hailstorm visited Governours Harbour, Eleuthera, about sixty miles east of Nassau. A report from the Resident Justice of that settlement states that "it rained very hard for a half hour, with moderate wind from east. The wind then freshened and veered to southeast when hail began falling very heavy and lasted about fifteen minutes. The wind then fell some and shifted to the southwest with renewed rain. Next morning the effects of the hail could be seen on buildings and trees and it was on the ground in some places about six inches. A number of small birds were killed. The hailstorm did not extend for more than a quarter of a mile around the town. Nearby cultivated areas were slightly damaged. Rainfall 1.75 inches."

A FAKE RAIN MAKER.

Mr. Otto J. Klotz, the Chief Astronomer of the Dominion of Canada, and a very active friend of honest meteorology, kindly sends the following extract from The News, of Toronto, March 3, 1906. We know of no better way to protect the public than to expose the pernicious activity of the fake rain makers, the hail preventers, and the planetary forecasters:

Ottawa, March 3.—In the appropriation ordinance passed last autumn by the Yukon Council appears a vote of $5000 for the purpose of "encouraging meteorological experiments on the Dome"—the peak which dominates the vicinity of Dawson—"in the summer of 1906." This innocent item covers one of the quaintest pieces of administration ever perpetrated by a Canadian legislative body.

The rainfall is an important consideration in the Yukon, as the miners need water for their operations, and a wet summer is as advantageous as a dry one is the reverse. So far as observations extending over a very few years can serve as an indication, wet and dry summers roughly alternate. The summer of 1905 was marked by a drought, so that the balance of probabilities is in favor of a rainy summer this year.

Southern California for some time has been the home of a rain maker, one Hatfield, whose method of operation seems to be the liberation of certain chemicals, which are supposed to induce showers. Mr. Hatfield has advertised his methods and his alleged successes with some enterprise, and the administration of the Yukon has become an admirer of his. The "meteorological experiments" are to be conducted by him, and the $5000 is for him.

STANDS TO WIN ANYWAY.

Private persons have subscribed $5000 and the Yukon Council supplies another $5000. Mr. Hatfield is to spend the summer in the country and his expenses, estimated at $2000, are to be defrayed in any event. If it rains, he is to get the other $8000. Thus Mr. Hatfield occupies an advantageous position in the bargain. He will get $2000 expense money in any event, and he will get $8000 more, (1) if he "makes" the rain, or (2) if the rain happens to come independently of his liberation of chemicals.

Moreover, as already noted, in any event the chances favor rain this summer.

Next, who is Mr. Hatfield? The standing of the United States Weather Bureau at Washington can not be doubted. A request for information, addressed to the Bureau, elicited the following reply:

"Mr. Hatfield attained considerable notoriety in the United States last fall as a pretended rain maker, operating in southern California. The judgment of the Weather Bureau as to this pretension may be found in the accompanying extract contained in the closing paragraph of a letter written by the Chief of the Bureau, October 20, 1905, in reply to a request for information relative to Mr. Hatfield:

"It is, therefore, apparent that the rainfall which was supposed to have been caused by the liberation of a few chemicals of infinitesimal power was simply the result of general atmospheric conditions that prevailed over a large area. It is hoped that the people of Kansas and of other regions in the subarid West will not be misled in this matter, and give undue importance to experiments that doubtless have no value. The processes which operate to produce rain over large areas are of such magnitude that the effects upon them of the puny efforts of man are inappreciable."

In another letter on the subject, to be found in the issue of the MONTHLY WEATHER REVIEW for April, 1905, Mr. Willis L. Moore, the Chief of the United States Weather Bureau, corrected some statements put forward on Mr. Hatfield's behalf. "Your dispatch," he wrote, "stated that the heaviest rain fell in the region of the rain maker, and that the rainfall had not been large in any of the other regions of the subarid West. This statement is erroneous, as during the same period general and excessive rains occurred throughout Arizona and New Mexico. It is known that when barometric pressures for a month are low in the Southwest, the period is one of frequent and heavy rains in that region, and this barometric condition prevailed over New Mexico, Arizona, and southern California during the 3-month period under consideration."

It is rather disagreeable to reflect that at the very time that these warnings were being issued against Mr. Hatfield, the administration of the Yukon was proving so easy a mark for his efforts. What makes this the more striking is that the Yukon Council is not a particularly democratic institution. It is a strongly official body, perhaps a majority of its members being selected from Ottawa—presumably on account of their intelligence, general information, and administrative fitness.

OUTLINE FOR THE STUDY OF METEOROLOGY IN THE NEW YORK STATE NORMAL SCHOOL.

The Education Department of the State of New York gives considerable attention to the study of meteorology, as a part of the course in geography. The special development of this subject, at the State Normal and Training School in Oswego, is explained by Prof. Amos W. Farnham in the Journal of Geography for February, 1906. We select the following items from his schedule of the study of that subject.

After a series of studies on the earth as a planet, covering the subject of its shape and motion, there comes the section bearing on the gaseous atmosphere, to be followed by physiography, and commercial and political geography. We condense Section II as follows:

II. The gaseous envelope.
- A. Atmosphere. 1. Origin. 2. Function.
- B. Composition. 1. Oxygen. 2. Nitrogen. 3. Carbon dioxide. 4. Water vapor. 5. Dust—inorganic and organic. 6. "Precious" gases (argon, krypton, helium).
- C. Temperature—degree of heat. 1. Measurement of temperature. 2. Heat. 3. Various elements affecting temperature. 4. Isotherms. Isothermal charts studied. Heat equator, cold pole. 5. Thermograph. 6. Heat belts—their areas and boundaries by isotherms.
- D. Pressure and density. 1. Relation of pressure to density. 2. Relation of density to temperature. 3. Density diminished by diminished gravity, by increased temperature, and by increased amount of water vapor. 4. Measurement of pressure.
- E. Movements of air—currents. 1. In vertical plane. 2. In horizontal plane—wind. 3. Origin of currents—unequal density of adjacent masses. 4. Classification of winds; planetary; cyclonic winds; tropical hurricanes; western tornadoes; diurnal winds; seasonal winds—monsoons. 5. Deflection of winds—Ferrel's law. 6. Velocity—measured by anemometer. 7. Classification of winds based on velocity.
- F. Humidity—measured by hygrometer. 1. Absolute and relative. 2. Condensation; causes; forms; distribution—unequal.

CORRIGENDUM.

MONTHLY WEATHER REVIEW for December, 1905, Vol. XXXIII, page 535, column 2, in Table 1, year 1882, losses paid, for "52,112" read "52,122."

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

During the first half of February a succession of areas of low barometric pressure of moderate intensity crossed the British Isles, two well-defined disturbances moved from the southeastern portion of the Gulf of Mexico northeastward near the Atlantic coast line of the United States, and three areas of high barometer of great magnitude, attended by pronounced cold waves, advanced from the British Northwest Territory to the Atlantic coast. About the middle of the second decade of the month the succession of barometric depressions over the Eastern Atlantic Ocean became slow, and during the latter portion of that decade pressures fell over the Azores, and stagnated barometric conditions and high temperatures set in over the United States east of the Rocky Mountains. The closing days of February were marked by rapid and pronounced weather changes over the United States and in the higher latitudes of the North Atlantic Ocean.

The month was warmer than usual over the Great Plains and thence to the Pacific coast and also over a great portion of the upper Lake region and New England, the departures above the normal exceeding 9° on the northeastern slope of the Rocky Mountains. In the Ohio and middle and lower Mississippi valleys and thence to the Gulf and middle and south Atlantic coasts, monthly mean temperatures were below the normal.

Precipitation was irregularly distributed, both as regards amounts and departures from the normal.

The paths of the more important areas of low barometric pressure, or general storms, of February are traced on Chart III.

The first storm of the month advanced from the eastern portion of the Gulf of Mexico to Nova Scotia during the 8th and 9th, attended by heavy rain in the east Gulf and South Atlantic States, by snow in the Middle Atlantic and New England States, and by high easterly shifting to northwest winds along the middle Atlantic and southern New England coasts. During the 12th and 13th high winds off the Atlantic coast attended the northeastward advance of a disturbance from the Florida Peninsula. Three disturbances moved eastward from the extreme north Pacific coast during the second decade of the month, their influence in the United States being shown mainly in the warm southerly winds that prevailed over the northern districts from the 15th to 20th. Low area XII, that moved from British Columbia to the Carolina coast from the 24th to 28th, was attended by heavy snow from the middle Mississippi Valley over a great part of the Ohio Valley and in southern portions of the Middle Atlantic States. During the 27th and 28th a disturbance of marked strength advanced eastward over the middle Plateau and middle Rocky Mountain regions.

The first well-defined cold wave of the winter of 1905–6 advanced from Manitoba to the Atlantic coast from the 1st to 3d, with temperature 30° below zero at Winnipeg, Man., on the 1st, and 24° below zero at Sault Ste. Marie, Mich., on the 2d. On the morning of the 3d the temperature was below zero in the interior of New York and New England, the line of 10° was traced through the District of Columbia and southwestern Virginia, and the line of freezing temperature through northwestern Florida. From the 3d to 6th a cold wave advanced from the Rocky Mountains over the central valleys and the Middle Atlantic and New England States, carrying the line of zero temperature to Kansas, the Ohio River, and the interior of New York and New England. From the 13th to 15th a cold wave swept from British America to the Atlan-